The Mining Journal
AND COMMERCIAL GAZETTE.

SUPPLEMENT.

It is in accordance with the wishes of several Subscribers, that instead of reducing the price of the Mining Journal *below Sixpence, the course should be adopted of increasing not only the matter, but the interest which must be attached to a publication where so many sciences are involved with that of Mining. To effect this object,* AN ENLARGED SHEET WILL BE PUBLISHED EVERY FORTNIGHT, WITHOUT ANY ADDITIONAL CHARGE; *and as it will be continuous, embracing reviews of works associated with the Mining interests and scientific intelligence generally, it will in itself form a volume distinct from the* Mining Journal. *The first number is given with the present week, and, although it is intended only to be published with the alternate numbers,* IT WILL BE CONTINUED EACH WEEK FOR THE NEXT MONTH, *with the view of doing justice to several subjects and works which have alone remained unnoticed from the press of Mining correspondence.*

The folios will be distinct from those of the Mining Journal, *so that the Supplement may either be bound up with that publication, or in a separate form.*

PROCEEDINGS OF SCIENTIFIC MEETINGS.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The sixth meeting of the British Association was held, as our readers are aware, at Bristol, commencing on Monday, 22d August, and terminating on Saturday, 27th. The number of members present is stated to have been about 1300, and although not a few of the neighbouring residents were, as usual, enrolled merely for the occasion, the meeting comprised a large proportion of the names most distinguished in science throughout the British empire. Associated with this great assemblage of men of science, it was gratifying to witness the presence of many individuals of high rank and station, some of whom are not less distinguished for scientific attainments than for the advantages of birth and fortune. The meeting was also attended by many foreign philosophers of great and deserved eminence, who had visited this country for the purpose of taking part in its proceedings.

The president appointed for the present year was the Marquis of Lansdowne, but this nobleman was prevented from attending by the serious illness of his eldest son, the Earl of Kerry, which, we regret to say, terminated fatally, previous to the Association completing its labours. The office of president, thus unhappily rendered vacant, was, however, most ably filled by the Marquis of Northampton, a nobleman distinguished for his attachment to science and literature, to whom the Association was much indebted for undertaking, at a very short notice, a post of so much difficulty and importance.

The business of the Association was managed by a general committee, as on former occasions, and sub-committees presided over the various sections, seven in number, by which the several branches of science were discussed. The sections were as follows:—Section A. Mathematical and Physical Science.—Section B. Chemistry and Mineralogy.—Section C. Geology and Geography.—Section D. Zoology and Botany.—Section E. Anatomy and Medicine.—Section F. Statistics.—Section G. Mechanical Science. In each of these sections numerous and important communications were brought under consideration, the various subjects being discussed with the temper and ability which might have been expected from so distinguished a body.

Very full and accurate reports of the proceedings have already been given by several of our contemporaries, of which we shall freely avail ourselves in the following sketch, acknowledging our obligations more especially to the able and talented pages of the *Athenæum*. On glancing over the various sections, it will at once be seen that some of the subjects discussed are but remotely, and others not at all, connected with the objects of this paper; it will therefore be our province to extract from the communications made to the Association all such information as bears upon Mining, and its kindred subjects—Mineralogy, Geology, Chemistry, Mechanical Science, &c.; and, through the kindness and assistance of friends, to render this information as full and as accurate as possible.

In order to give a general view of the proceedings of the meeting, we shall, in the first place, notice the constitution of the committees of each section, together with all the papers and communications laid before them; then proceeding to select from each department all such information as bears in any degree upon the subjects embraced in the *Mining Journal*, or which we consider likely to be generally interesting to our readers.

GENERAL COMMITTEE.

Trustees (Permanent)—C. Babbage, Esq., F.R.S.; R. J. Murchison, F.R.S.; John Taylor, Esq., F.R.S.
President—The Most Noble the Marquis of Lansdowne.
Vice Presidents—The Most Noble the Marquis of Northampton, F.R.S.; Rev. W. D. Conybeare, F.R.S.; James C. Prichard, M.D., F.R.S.
General Secretaries—Francis Baily, F.R.S.; Rev. Wm. V. Harcourt, F.R.S.
Assistant General Secretary—Professor Phillips, F.R.S.
Treasurer—John Taylor, F.R.S.
LOCAL OFFICERS—*Treasurer*—George Beugough, Esq.
Secretaries—C. Daubeny, M.D., F.R.S.; V. F. Hovenden, Esq.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

President—Rev. W. Whewell.
Vice Presidents—Sir D. Brewster; Sir W. R. Hamilton.
Secretaries—Professor Forbes; W. S. Harris, Esq.; F. W. Jerrard, Esq.
Committee—C. Babbage, Esq., F.R.S.; F. Baily, Esq.; Professor J. Challis; Mr. Chatfield; Professor Mc Cullagh; R. W. Fox, Esq.; William Frend, Esq.; G. Gerrard, Esq.; Professor Lloyd; J. W. Lubbock, Esq.; Rev. Dr. Lloyd, Provost of Trin. Coll.; Professor Moil; Rev. G. Peacock; Professor Rigaud; Professor Ritchie; J. Robinson, Esq.; Professor Stevelly; H. F. Talbot, Esq.; Professor Wheatstone.

The following list embraces the various papers and other communications made to this Section at the present meeting:—

Sir David Brewster reported progress as to the experiments directed at the former meeting to be instituted on the construction of a Lens of Rock Salt.

Mr. Lubbock communicated the result of some important Observations on the Tides at the Ports of London and Liverpool.

Mr. Whewell reported proceedings of the Committee appointed by the Association to fix the relative Level of the Land and Sea.

Mr. Lubbock introduced a paper on the formation of an empirical Lunar Theory.

Professor Sir William Hamilton gave an account of Mr. Jerrard's Mathematical Researches connected with the general Solution of Algebraical Equations.

Professor Phillips made a brief statement of the operations of the Committee appointed by the Association for the purpose of making a series of experiments to determine the Subterranean Temperature of the Earth.

Mr. Craig read a paper on the Polarization of Light.

Mr. Russell read an important paper on the Phenomena of Waves and Currents.

Professor Powell communicated some observations on Refractive Indices.

Sir David Brewster read a paper on a Singular Development of Polarizing Structure in the Crystalline Lens of Animals after Death.

The Rev. Mr. M'Cauley read a paper in continuation of one communicated to the Association last year, on the application of Electro-Magnetism to Mechanical Purposes.

Mr. Harris read a paper on some Phenomena of Electrical Repulsion.

Professor Challis made a supplementary Report on the Mathematical Theory of Fluids.

Professor Stevelly made some remarks on the Interpretation of the Doubtful Sign in certain Algebraical Formulæ.

Mr. M'Culloch read a paper on the Laws of Double Refraction of Quartz.

Mr. Adams made a communication on the Interference of Sound.

Mr. Talbot reported his Researches on the Integral Calculus.

Dr. Apjohn read a paper on the Specific Heat of Gases.

Professor Hamilton made a communication on the Calculus of Principal Relations.

The Rev. William Scoresby described two Magnetical Instruments.

Professor Forbes read a paper on the Terrestrial Magnetic Intensity at various Heights.

Sir David Brewster read a paper on the Action of Crystalline Surfaces.

Mr. W. G. Hall made some remarks on the Connexion of Weather with the Tide.

Mr. Ettricke read papers "On an Instrument for observing Terrestrial Magnetism;" "On improved Rubbers for Electrical Machines;" and "On a New Instrument for Trying the Effect of Electrical Discharges in Rarefied Air, or in different kinds of Gases."

Mr. Addams made some observations on the Vibration of Bells.

Dr. Reutzi introduced a paper "On the Higher Order of Grecian Music;" and another "On Mnemonic Logarithms."

Mr. Whewell read a paper on a New Anemometer.

Professor Phillips read a notice of the probable Effects of Elevated Ground in the Direction of the Lines of equal Magnetic Dip.

Sir David Brewster described some valuable Improvements in the Telescope.

Mr. Russell read a paper on certain Elements of the Resistance of Fluids that appear to be internally connected with the application of Analysis.

Dr. Hare made a communication on the Electric Spark.

Dr. Carpenter describing a system of Teaching the Blind to Read.

Mr. Hodgkinson gave an account of some experiments made at the request of the Association, to determine the comparative Strength and other Properties of Iron, made with the Hot and Cold Blast.

SECTION B.—CHEMISTRY AND MINERALOGY.

President—Rev. Professor Cumming.
Vice Presidents—Dr. Dalton; Dr. Henry.
Secretaries—Dr. Apjoha; Dr. C. Henry; W. Herapath, Esq.

Committee—Dr. Barker; Professor Daubeny; C. T. Coathupe, Esq.; Rev. Wm. Vernon Harcourt; Professor Hare; Professor Johnston; G. Lowe, F.R.S.; Professor Miller; R. Phillips, Esq.; Dr. Roget; Dr. R. D. Thomson; Dr. Turner; Dr. T. Thompson; T. Thompson, Jun., Esq.; H. H. Watson, Esq.; William West; Rev. W. Whewell; Dr. Yellowley; Col. Yorke.

The following communications were made to this Section:—

Mr. Watson communicated the results of experiments on the Pyrophosphate of Soda.

Mr. Ettricke described a new form of Blowpipe.

Mr. Herapath produced an Analysis of the Water of the King's Bath, at Bath.

Dr. Hare, of Philadelphia, made an important communication on Rock-Blasting; and also described a Gas-meter which he had for many years found of great use, but which had not yet been used in this country.

Mr. William Herapath gave a short account of the Aurora Borealis of the 18th of November, 1835.

Mr. Thomas Edley furnished a paper entitled "Important Facts obtained Mathematically from Theory; embracing most of those experimental results in Chemistry which are considered as ultimate Facts."

Dr. Charles Henry read a paper on the Power of certain Gases to prevent the Union of Oxygen and Hydrogen.

Mr. W. Herapath read a paper on Arsenical Poisons.

Dr. Hare made some observations on the Improvements of the Galvanic Pile.

Dr. Daubeny read a report on the Present State of our Knowledge with regard to Mineral Waters.

Mr. Mushet exhibited specimens of Iron Ore, and also of an Iron Cement, which he stated to possess superior binding properties.

Professor Johnson explained the Constitution and Properties of Para Cyanogen.

Mr. W. West read a paper on the Substances diffused through the Atmosphere.

Dr. Hare read a copy of a correspondence between Berzelius and himself, on Chemical Nomenclature.

Dr. Dalton made some observations on Atomic Symbols.

Professor Johnston brought before the Section his Chemical Tables, of which a specimen, entitled "Chemical Constants," had been laid before the Association in Dublin.

Dr. Thomson read a detailed account of Experiments on the Combinations of Sulphuric Acid and Water.

Mr. W. C. Jones read a paper on a peculiar Modification of Gluten.

Mr. Crosse described certain Improvements in the Voltaic Battery; and also read a paper on Atmospheric Electricity.

Mr. Scanlan gave an account of a New Compound, found during the Destructive Distillation of Wood.

Professor Davey described a peculiar Compound of Carbon and Potassium, and also a new Gaseous Bicarburet of Hydrogen.

Dr. Inglis made some remarks on the Conducting Power of Iodine.

Dr. Knox made some observations on Fluorine.

Mr. Black described a mode of detecting the Strength of Spirits by Diluting with Water.

Dr. Trail made a communication on the Aurora Borealis.

SECTION C.—GEOLOGY AND GEOGRAPHY.

President—Rev. Dr. Buckland.
Vice Presidents—R. Griffith, Esq.; G. R. Greenough, Esq.
(*For Geography*)—R. I. Murchison, Esq.
Secretaries—W. Sanders, Esq.; S. Stutchbury, Esq.; T. J. Torrie, Esq.
(*For Geography*)—F. Harrison Rankin, Esq.

Committee—H. T. De la Beche, Esq.; M. Van Breda; Joseph Carne, Esq., Penzance; Edward Charlesworth, Esq.; Major Clerke; Lord Cole; Rev. W. Conybeare; R. Griffith, Esq.; Rev. W. Hopkins; R. Hutton, Esq.; B. Ibbotson, Esq.; Rev. T. T. Lewis; J. Macadam, Esq.; Sir G. Mackenzie; M. Van der Melen; Lord Northampton; Professor Parigot; Professor Phillips; Professor Sedgwick; W. Smith, Esq.; John Taylor, Esq.; Dr. William West; Samuel Worsley, Esq.; Rev. James Yates.

The following communications were made to this Section:—

Mr. Charlesworth read a notice of the Vertebrated Animals in the Crag-formation.

Mr. Bowman read an account of a visit to the Bone Caves of Cefu, in Denbighshire.

Mr. Ibbotson exhibited Geographical Models of Neufchatel, and of the Under Cliff, in the Isle of Wight.

Dr. Daubeny stated the results of some experiments on the Effects of Arsenic on Vegetables.

Professor Sedgwick and Mr. Murchison, communicated a paper "On the Classification of the Old Slate Rocks, and True Position of the Culm Deposits of Devonshire."

Mr. De la Beche read a paper on the Connexion of the Geological Phenomena with the Mines of Cornwall and Devon.

Professor Phillips made some observations on the Removal of Large Blocks or Boulders from the Rocks of Cumberland.

A communication was received from Dr. Riley and Mr. Stutchbury, on certain Saurian Bones discovered near Bristol.

Dr. Buckland produced a Bone, which had been found upon the red sandstone in Bristol, supposed to be part of the remains of one of the rioters burnt at the Custom-house, the animal matter of which having been roasted out, the cavities had become filled with lead.

The Marquis Spineto read a report of the attempts made to ascertain the Latitude of the ancient City of Memphis.

Dr. Buckland placed upon the table specimens of the engravings of some of the Fossils in the Bristol Institution, prepared under the direction of M. Agassiz; and also a copy of the first volume of his Treatise on Geology, for the Bridgewater Series.

Mr. Fox read an important paper on the Change in the Chemical Character of Minerals induced by Galvanism.

Mr. Crosse made some communications of the highest interest on the Formation of Artificial Crystals and Minerals.

Mr. Conybeare read a paper on the Coal-fields of South Wales.

Mr. Murchison communicated some remarks on the Geological Relations of certain Calcareous Rocks, near Manchester; and also on the ancient Hydrography of the River Severn.

Lord Nugent read a communication respecting some Sea Rivulets in the Island of Cephalonia.

Mr. Charlesworth read a paper on some alleged fallacies in determining the Ages of Tertiary Deposits.

Professor Forbes made a communication on the Connexion of the Pyrenean Hot Springs with the Geology of the District.

The Rev. Mr. Clarke gave an account of some Hot Springs at Longleat.

SECTION D.—ZOOLOGY AND BOTANY.

President—Professor Henslow.
Vice Presidents—Rev. F. W. Hope; Dr. I. Richardson; Professor Royle.
Secretaries—John Curtis, Esq.; Professor Don; Dr. Riley; S. Rootsey, Esq.

Committee—Wm. Yarrell, Esq.; Rev. Mr. Jenyns; T. Mackay, Esq.; C. Babington, Esq.; Professor Nilsson; Hon. Charles Harris; Rev. Mr. Phelps; Rich. Taylor, Esq.; T. C. Eyton, Esq.; J. E. Bowman, Esq.; W. C. Hewitson; Professor Scouler; Dr. Jacob; Rev. Mr. Ellecombe; G. J. Jeffrys, Esq.; R. M. Ball, Esq.; Colonel Sykes; J. L. Knapp, Esq.; — Vigors, Esq.; E. Forster, Esq.

The following communications were made to this Section:—

Dr. Richardson communicated, in several readings, his Report on North American Zoology.

Mr. Rootsey announced the results of various experiments to Extract Sugar, Spirit, &c. from Mangel Wurzel.

Professor Henslow made some observations on the Formation of Sugar in Plants.

Mr. W. G. Hall read a paper on the Acceleration of the Growth of Wheat.

Mr. Bowman read a paper on the Longevity of Yew Trees.

Mr. Ball gave an account of a New Species of the Seal.

Dr. Hancock exhibited a specimen of a New and Scandent Species of *Narantea*.

The Rev. Mr. Hope exhibited an Hermaphrodite Lucanus.

Mr. Hope read an interesting paper on certain Notions of Antiquity derived from the Ancients.

Mr. Hall introduced the subject of the application of Lime as a Manure.

Colonel Sykes made some observations on the Fruits of the Deccan, of which he produced drawings.

Mr. J. T. Mackay read a report on the Geographical Distribution of Plants in Ireland and the West of Scotland.

Mr. Royle introduced the subject of Caoutchouc, with some interesting particulars of its Importation and Application in Manufactures.

Mr. Duncan brought forward the subject of the Luminosity of the Sea, for the purpose of eliciting information respecting so beautiful a phenomenon.

Dr. Hancock gave an account of the Cow-Fish, or River Cow.

Dr. Macartney read a paper on the Mode of Preserving Animal and Vegetable Substances.

The Rev. Mr. Hope read a communication from Mr. Ruddon, on the Means of obtaining Insects from Turpentine.

Mr. Carpenter read a communication on the "Criteria of Species," founded on the views of Dr. Prichard.

SECTION E.—ANATOMY AND MEDICINE.

President—Dr. Roget.
Vice Presidents—Dr. Bright; Dr. Macartney.
Secretaries—Dr. Symonds; G. D. Fripp, Esq.

Committee—Dr. O'Beirne; Dr. Bernard; Dr. James Bernard; S. D. Broughton, Esq.; R. Carmichael, Esq.; Dr. Carson; Bracey Clarke, Esq.; E. Cock, Esq.; J. W. Cusack, Esq.; H. Daniel, Esq.; J. B. Estlin, Esq.; Dr. Evanson; W. Hetling, Esq.; Dr. Hodgkin; Dr. Houston; Dr. Howell; Dr. James Johnson; R. Keate, Esq.; O. King, Esq.; Dr. Prichard; O. Rees, Esq.; Dr. Riley; Richard Smith, Esq.; J. C. Swayne, Esq.; N. Vye, Esq.; Dr. Yellowley.

The following communications were made to this Section:—

Dr. O'Beirne presented a report from the Dublin Committee on the Pathology of the Nervous System.

Dr. Prichard read a paper on the Treatment of Diseases of the Brain.

Dr. Houston described a Twin Fœtus, born without brain, heart, or lungs.

Mr. Carmichael read a paper on Tubercles.

The London and Dublin Committees forwarded reports on the Motion and Sounds of the Heart.

Mr. Greeves introduced a paper on the Gyration of the Heart.

Dr. Brewster read a paper on the Polarization of Light.

Dr. Canon read a paper on Absorption.

Dr. Hodgkin communicated some observations on the Connexion between the Veins and Absorbents.

Dr. Reid produced a short exposition of the Functions of the Nervous Structure.

Dr. Macartney exhibited a Portable Probang, and read two short papers, one on the Organs of Voice in the New Holland Ostrich, and the other on the Structure of the Teeth.

Mr. Walker read a paper on the Nerves and Muscles of the Eyeball.

Mr. Adams made some observations on the Pathological Condition of the Bones in Chronic Rheumatism.

Mr. Hettling explained a New Mode of removing Ligatures.

Dr. Evanson made a report on a Fracture of the Neck of the Thigh-bone.

Mr. W. B. Carpenter read a paper on the Origin of Parasitic Animals.

Dr. R. T. Thompson explained the Chemistry of the Digestive Organs.

SECTION F.—STATISTICS.

President—Sir Charles Lemon, Bart.
Vice Presidents—H. Hallam, Esq.; Dr. Jerrard.
Secretaries—Rev. J. E. Bromby; C. B. Fripp; James Heywood, Esq.
Committee—J. W. Cowell, Esq.; Baron Dupin; Lord King; Professor Babbage; Dr. Bowring, M.P.; T. Wyse, M.P.; Rev. E. Stanley; Col. Sykes; Dr. W. C. Taylor; Henry Woolcombe, Esq.; J. Simpson, Esq.; M. Von Raumer; Right Hon. T. S. Rice; Major Clerk; — Porter, Esq.; Professor Mounier; Lord Sandon; Lord Nugent; Carpenter Rowe, Esq.; Thomas Moore, Esq.; Rev. W. L. Bowles.

The following communications were made to this Section:—

Dr. M'Cleland communicated, at great length, some Statistical facts connected with the former and present state of Glasgow.

Mr. Kingsley presented various Tables relative to the Revenue and Expenditure of the United Kingdom.

Baron Dupin made some observations on a paper which he produced, entitled, "Researches relative to the Price of Grain, and its Influence on the French Population."

Mr. Porter produced a report of the Effects of Vaccination.

Colonel Sykes, from the Royal Asiatic Society of Great Britain, announced the Formation of a Committee of that Society, for the purpose of collecting Statistical Information respecting India, chiefly with the view to the Promotion of Commercial Intercourse.

Mr. Gregg's Outlines of a Memoir on Statistical Desiderata was read.

Dr. Lardner made an important communication on the Effects of Railroads on International Communication.

Mr. Taylor, Treasurer of the Association, communicated a paper on the Mineral Riches of Great Britain.

Dr. Yellowley read a paper on the Employment of Spade Husbandry.

Professor Forbes detailed the results of Experiments on the Height, Weight, and Strength of 200 Individuals, Natives of England, Scotland, Ireland, and Belgium.

Dr. Collins communicated a paper on the Periodicity of Births.

Baron Dupin exhibited Two Maps of Great Britain and Ireland, curiously shaded, to show the Comparative Density of Population, and the Comparative State of Crime.

A report from the Manchester Statistical Society, on the State of Educa-

tion in Liverpool, was read; also, the Statistics of Popular Education in Bristol.

Lord Sandon moved a recommendation to the East India Company to take measures for procuring a census of the population under their government.

Section G.—MECHANICAL SCIENCE.

President—Davies Gilbert, Esq.

Vice Presidents—M. I. Brunel, Esq.; John Robison, Esq.

Secretaries—T. G. Bunt, Esq.; G. T. Clark, Esq.; Wm. West, Esq.

Committee—Captain Chapman; G. Cubitt, Esq.; J. S. Enys, Esq.; Wm. Hawkes, Esq.; E. Hodgkinson, Esq.; Dr. Lardner; Professor Moseley; M. le Playe; Sir John Rennie; George Rennie, Esq.; John Taylor, Esq.; Rev. W. Taylor.

The following communications were made to this Section:—

Professor Moseley made some observations on the Theory of Locomotive Carriages.

Mr. Russell, of Edinburgh, laid before the Section the result of certain experiments on the Traction of Boats in Canals at different Velocities.

Mr. Henwood communicated a paper on Naval Architecture.

Mr. Corsham described certain improvements in Neper's Rods for Facilitating the Multiplication of High Numbers.

Dr. Daubeny explained an instrument of his contrivance for taking up Sea Water from any given depth.

Mr. Braham explained certain improvements made by him in the Mariner's Compass.

Mr. Price exhibited a Model of a New Construction of Paddle-wheels.

Mr. Chatfield read an Essay on Naval Architecture.

Mr. Enys gave an account of the Working of the Cornish Steam-engines.

Mr. Pinkus read a paper on the Transmission of Power by the Rarefaction of Air.

Dr. Lardner delivered, at different sittings, some highly interesting discourses on Steam Communication with various foreign parts.

The number, variety, and importance of the communications made to the Association will be rendered evident by glancing over the preceding list, and from them we now proceed to extract those which are most likely to interest the readers of the *Mining Journal*, from their connexion with the objects to which this paper is devoted.

From the Mathematical and Physical Section our extracts will necessarily be few in number, while from those of Chemistry and Mineralogy, Geology and Geography, they will be far more copious. The Sections of Zoology and Botany, Anatomy and Medicine, are obviously out of our province. In the Section of Statistics many valuable facts may be gleaned, while in that of Mechanical Science we shall be enabled to obtain much valuable information.

Previous to entering on the actual business of the Sections, it will be proper to give a sketch of the proceedings at the general meeting of the Association, which took place at the Theatre on the first day of the meeting. The business was opened by the Rev. Dr. Lloyd, Provost of Trinity College, Dublin, who, as President of the last year's meeting, took the chair on the occasion, and delivered the following address previously to resigning office to the Marquis of Northampton:—

My Lords and Gentlemen,—Ever since the origin of this Association, I have looked forward to its annual meetings in the assured expectation of the highest intellectual enjoyment; and it is scarcely necessary for me to add, that in these delightful anticipations I have never been disappointed. Indeed, when I consider the purposes for which you are associated, and the powers by which those purposes are to be effected, it would seem to me impossible that any hopes of this kind, however sanguine, should end in disappointment;—for here it is my unspeakable privilege to mix with the *élite* of this great country—with all that are distinguished by talents and attainments in each of the numerous departments of science; and not more distinguished by those high qualifications, than they are by the exalted purposes for which they are met together. Those purposes are, by a more rapid and extensive communication of the lights of science as they are struck out, and by carrying these things home to the doors of all, to awaken to exertion those gigantic powers of mind, which are not confined to a few favoured spots, but which are every where to be found; and by establishing a more immediate and intimate communication among those engaged in kindred pursuits—to unite their exertions, as it were, into one simultaneous effort, and thereby to accelerate the progress of discovery in every line in which the mysteries of nature may be penetrated by the ingenuity and perseverance of man.

Leaving to others to seek their intellectual entertainment in the way most agreeable to their own tastes, the efforts of this Association are directed to the investigation of those realities by which we are surrounded, and of the powers with which they are invested, which, whilst they point to the being and the attributes of the One Great Source of all Existence, whom to know is to adore, do also constitute the means which He has placed within our reach, and in our hands, for the improvement of this our present condition.

This is a labour in which all of every grade are alike interested, and in which all will, at least, bid you God speed. Accordingly, it will be observed, that the regards of all, of the humble as well as of those in the most exalted stations, are directed towards your proceedings; and that every where multitudes continue to press around you, not merely as curious spectators, but as active workmen. Here the mechanic repairs to lay before you his inventions for giving increased effect to human industry, as well as the philosopher who seeks to render the forces belonging to inanimate matter a substitute for manual labour, and thereby to ease mankind of more than half their toils; and here also the statesman seeks to perfect himself in the knowledge of the nature and extent of the materials at his disposal, for effecting the improvements he contemplates in the social edifice.

Though myself an unprofitable spectator of your exertions, I would claim to be considered as one greatly interested in your success. I am fully sensible that this is but a poor claim to the notice with which I have been honoured; and I can assure you, gentlemen, that any language at my command would be no less poor to convey the feelings it has excited. I cannot therefore trust myself in making the attempt, but must confine myself to the simple declaration, that the feelings awakened by your unmerited kindness, far from any admixture of self-complacency, are those of the humblest, as well as of the warmest gratitude.

With respect to the Presidency itself, with which I have been so highly honoured, I think that it may be compared to a brilliant gem, to which it bears many striking analogies, but chiefly in this, that whilst it dignifies every thing with which it is connected, its own native lustre can neither be impaired nor improved by any adventitious circumstance. Yet in returning this precious gem with my unfeigned acknowledgments, you will permit me to offer my hearty congratulations, that the splendid setting it is now to receive, is in so much better keeping with its own inherent beauty and its inestimable value.

At the conclusion of his address, Provost Lloyd resigned the chair to the Marquis of Northampton, who, on addressing the Association, alluded to the cause which had deprived the meeting of Lord Lansdowne's services: he was sure that there was no person present who did not feel a sympathy for the afflicted father, and a sincere anxiety for the recovery of the suffering son. The subject was a painful one; but the illness of a young nobleman of such high promise as the Earl of Kerry, would, he was assured, be deemed a grievous affliction to all who knew his merits; and secret prayers would be offered for his recovery in every heart in the assembly.

His Lordship congratulated the meeting on the great accession of members which the Association had received in Bristol. Some persons had doubted the utility of these *reunions*; but if any such sceptics were present, he would reply to them in the words of the sublimest epitaph ever written, "Monumentum si quæris, circumspice." Was it possible, when so many enlightened minds were thus brought together—when such a blaze of light was thus kindled, that its cheering rays should not extend to other minds, and light up in their bosoms the same holy fire? The effects of such assemblages were political and moral. Here were men of every shade of denomination and opinion engaged in one united effort in the cause of science and truth—eminent men from foreign lands, united by the glorious brotherhood of mind, were here assembled, to cement the intellectual union of nations. This he regarded as a political result of the highest and most gratifying order. The moral effect of the Association arose from truth being the great object of all its labours; and every truth directly led the mind to the consideration of the Eternal Being who had given us faculties to appreciate the wonders of his creation, and the wisdom by which the universe of matter was accommodated to the universe of mind. He alluded especially to astronomy, as leading us to reflect on the Omniscience—

> That had framed such laws,
> Which but to guess a Newton made immortal.

Every true philosopher was a religious man; and he who was not religious, was *pro tanto* not a philosopher. He need not recommend the foreign members to the attention of the citizens of Bristol: the natal place of Sebastian Cabot was already too well acquainted with the advantages to be derived from commercial intercourse with distant lands. He should, however, try to enlist the ladies in the service of the Association; they already possessed great influence; he would rather see it increased than diminished: he wished that they could persuade their husbands and lovers that science was as beauteous as themselves. Seriously (said his Lordship) much is in their power: the lessons taught by maternal love cling to memory with a fond tenacity which no future instructions can ever attain: they linger there when other lessons have been effaced by worldly cares, or removed by more urgent interests: and who shall say that it was not the maternal affection pointing out the beauties of a shell, a butterfly, or a flower, that first lighted up the sparks of genius in many an infant breast, which now is shining gloriously forth, the pride and wonder of the world?

The following report was then read by Dr. Daubeny, and contains an admirable summary of the labours of the Association during the last year, as evinced by the recently published volume of their Transactions, then lying on the table:—

Gentlemen,—The practice of the three preceding Anniversaries has prepared you to expect, at the first General Meeting that may be held, a short address, explanatory of the nature of those scientific objects which had chiefly occupied the Association on the former occasion, and, in particular, of the contents of the last published Volume of Transactions, in which the results of your labours are recorded. This it has hitherto been usual for the Local Secretaries of the year to prepare; and it seemed but a fair division of labour that such a task should, in the present instance, be allotted to the one on whom, from unavoidable circumstances, the smaller share in the other duties of the office had devolved. It was this consideration, indeed, which reconciled me to the undertaking; for had I not felt that the framing of this Address was the only part of the functions of Secretary that could be discharged at a distance from the intended place of meeting, and that the time of my colleague would be engrossed by the preparatory arrangements, in which, from my absence, I was unable till lately to participate, I should have shrunk from the responsibility of a task which involved the consideration of questions of a high and abstruse character, to several of which I feel myself but ill-qualified to do justice. It is therefore with extreme diffidence that I enter upon a task which has, at former meetings, been executed by men so eminent in science, and presume, though one of the humblest members of this great body, to exhibit to you a brief sketch of the labours of some of those individuals, whose presence amongst us sheds a lustre over our proceedings, and has contributed, more than any other circumstance, to draw together this great concourse here assembled.

There is, indeed, one circumstance, and one only, that gives me some claim to address you: I mean that of my having attended at all the meetings of this Association up to the present time, and hence having traced its progress through all its various stages, from its first small beginnings at York, up to this period of its full maturity, and having thus been enabled, by an actual participation in the business of all meetings, to form a juster estimate of the real condition of the Association, and of the services it has rendered to science, than could have been collected by the public at large.

Thus circumstanced, I have become sensible of results, flowing from the meetings of this great body, which can scarcely figure in a Report, or find expression in the accounts transmitted by the periodical press,—I have been struck by the enthusiasm elicited by the concourse of congenial minds—the friendships formed and cemented—the trains of experiment first suggested, or prosecuted anew after being long abandoned; above all, the awakening of the public mind to the just claims of science by the celebration of these anniversaries.

But it seems almost superfluous to dilate, to those actually present at such a meeting as this, on topics of the above description, when the mere fact of their being congregated here in such numbers, conveys the best assurance that such is already their conviction. Nor is it merely the assembling of so large a portion of the respectable inhabitants of this city and neighbourhood, nor yet the attracting from a distance so great a number of the mere amateurs of science, which justifies me in this conclusion, but it is the presence of so many hard-working, so many successful, cultivators of physical research, and their devoting to the service of the Association that most valuable of their possessions, their time, which gives me a right to assume, that the minds of those qualified to judge on such matters, are already made up respecting the beneficial influence which this Association is exerting. The volume, indeed, which now lies upon the table, and which contains the results of our last year's proceedings, not only amply sustains the former character of these transactions, but even shows more strongly than those which have preceded it, the power which the Association has been exercising in the direct advancement of science. It contains, in the first place, several valuable contributions to our knowledge of Magnetism,—a branch of science which, within a few years, stood in a manner isolated from the rest, but which now, thanks to the researches of living philosophers, is shown to be intimately connected with, or rather to be one of the manifestations of that mysterious, but all-pervading power, which seems to be displayed not less in those molecular attractions that bind together the elements of every compound body, than in the direction imparted to the loadstone; perhaps even in the light and heat which attend upon combustion, no less than in the awful phenomena of a thunder-storm.

Considering the connexion that subsists between the sciences of Heat, Electricity, and Magnetism, and considering, likewise, the efforts made with various degrees of success, and by men of very unequal pretensions, to develop the laws of each of these sciences in accordance with mathematical formulæ, one cannot wonder that the Association should have been anxious to assign to a member, no less distinguished for the depth of his mathematical attainments, than for the range of his acquaintance with modern science, the task of drawing up a Report on the theories of these three departments of Physics, considered in relation one to the other. This, accordingly, has been executed by Mr. Whewell, whose Report stands at the commencement of the volume.

The point of view in which he was directed to contemplate the subject, possesses an interest to all who are engaged in the investigation of natural phenomena, whatever may have been the particular bent to which their researches have been directed.

All the physical sciences aspire to become in time mathematical; the summit of their ambition, and the ultimate aim of the efforts of their votaries, is to obtain their recognition as the worthy sisters of the noblest of these sciences—Physical Astronomy. But their reception into this privileged and exalted order is not a point to be lightly conceded; nor are the speculations of modern times to be admitted into this august circle, merely because their admirers have chosen to cast over them a garb, oftentimes ill-fitting and inappropriate, of mathematical symbols. To weigh the credentials of the three physical sciences which have been pointed out as mathematical, was therefore a proper office for the Association to impose upon one of its members; and I believe it will be found that no small light has been thrown upon the subject by the manner in which that trust has been discharged.

With regard, however, to Magnetism, which forms one of the subjects of Mr. Whewell's Report, much still remains to be done, before the mathematician can flatter himself that a secure foundation for his calculations has been established; and the materials for this foundation must be collected from such a variety of isolated points, distant one from the other, both in time and place, dependent for their accuracy upon the occurrence of favourable circumstances, and, after all, demanding from the observer an uncommon union of skill and experience, that there is perhaps no scientific undertaking for which the co-operation of public bodies, and even of governments, is more imperiously demanded; and the Association has, in consequence, both engaged its members in the prosecution of these researches, and has proposed to obtain for them the national assistance. To call the attention therefore of the scientific world, in a greater degree, to the present condition of our knowledge as to Terrestrial Magnetism, was the object of Captain Sabine's Report in the present volume of these Transactions; and this he has accomplished by presenting us with an elaborate abstract of the work which Professor Hansteen, of Copenhagen, had published upon that subject.

This mathematician, in the year 1811, constructed a chart, in which were laid down, so far as could be ascertained, the lines of equal variation and dip of the magnetic needle in all parts of the world. It is curious to observe the degree of coincidence which exists between these lines representing the distribution of the magnetic force, and the isothermal lines by which Humboldt has expressed the distribution of heat over the earth's surface; and this apparent connexion, the cause of which remains a mystery, is calculated to stimulate our zeal for investigating the phenomena of both. Nor is it less interesting to trace in what degree these later observations appear to confirm the general conclusions arrived at by the celebrated Halley more than a century before. That astronomer had inferred, from a general review of all that was then known with regard to the variation and dip of the needle, that there must be two magnetic axes; whilst the gradual shifting of the line of no variation from west to east, led him to propose the ingenious, though whimsical hypothesis, of a moveable globe existing in the interior of the earth we inhabit, actuated by the same forces as those which propel the hollow sphere surrounding it, and, like it, possessing a north and south magnetic pole. This interior globe, if it be supposed to move with somewhat less rapidity than the exterior shell, might, as he conceived, produce a gradual shifting of the poles from east to west, and thus account for the difference observed from time to time in the position of the magnetic axes.

Now the researches of Professor Hansteen confirm the existence of two magnetic axes, though they led him to discard the hypothesis by which Halley accounted for their progressive shifting; which, indeed, the recently-discovered connexion between Electricity and Magnetism gives us hopes of explaining more satisfactorily, as has been shown by Professor Christie in the Report read by him at our third meeting.

Since the publication, however, of the great work to which his Magnetic Chart is appended, Professor Hansteen, aware of the mystery which still overhangs the subject, has been zealously employed in attempting to remove it, by ascertaining the present state and progressive change of the magnetic forces. He has accordingly employed himself in making observations on the line of no variation, or, as he prefers to call it, the line of convergence which passes through Siberia; and, by a fortunate concurrence of circumstances, the north-western expedition lately undertaken by British navigators, has afforded the means of obtaining, at the very same time, corresponding ones on the similar line, which extends from Hudson's Bay through the United States of America. Thus the position of these lines, in these two most interesting localities, has been almost simultaneously determined with an exactness before unequalled.

In conjunction with Captain Sabine, Professor Lloyd, of Dublin, has contributed, in another way, at the instance of the Association, to extend our acquaintance with the empirical laws of this interesting department of science. This they have effected by determining the dip and variation of the magnetic needle in different parts of Ireland, which it was considered the more important to ascertain, from the situation of that island, in the most westerly point of Europe at which observations could be instituted.

The distribution of the earth's magnetism through this country was determined by the above-named observers, first by a separate series of observations relating to the force of that portion of the magnetic influence which operates horizontally; secondly, by a similar series on the dip of the needle; thirdly, by means of observations both on the dip and intensity of the magnetic force made at the same time and with the same instruments.

It would occupy too much of the time of the Association were I to attempt to point out, however briefly, the precautions adopted, and the corrections applied, in order to arrive at accurate results. I shall therefore only remark, that the method by which the intensity of the magnetic force was ascertained resembles in principle that by which philosophers determine the force of gravity: for as a pendulum, when set in motion, oscillates on either side of the vertical line by the force of gravity, so the needle, when drawn out of its natural position, will oscillate on either side of the magnetic meridian by the earth's magnetic force; and hence, in either case, the force may be inferred to vary, inversely, as the square of the time in which a certain number of vibrations are performed. In order, however, to arrive at trustworthy results, many precautions must be adopted, which are pointed out in detail in Professor Lloyd's memoir, and in particular one relating to temperature; it being found that the same needle will vary in force about 1-4000th part for every degree of Fahrenheit. Having, however, arrived at a determination of the intensity of the magnetic force at the two extremities of the island, by a sufficiently-extended series of observations, namely, at Limerick by Captain Sabine, and at Dublin by Professor Lloyd, and having compared the results with those obtained by means of the same needles at a spot out of Ireland, whose magnetic intensity had been previously settled, by availing themselves of the observations of Captain James Ross, at London, our authors proceeded to estimate the relative intensity of the magnetic force at twenty-five different places within the compass of Ireland, by observations made at each of these simultaneously with others at Dublin or at Limerick. They thus obtained data by which to exhibit the law of Terrestrial Magnetism in Ireland, in a similar manner to that by which Humboldt laid down the laws of the distribution of Terrestrial Heat. The same principle was adopted in determining the lines of dip as of intensity; and the general result was obtained, that the angle which the lines of dip in Ireland make with the meridian of Dublin is 56° 48′, and that the dip increases one degree for every distance of 101 miles in a direction perpendicular to these lines.

The preceding method of estimating the intensity by the number of vibrations in a given time only applies to that portion of the earth's magnetic force which operates in a horizontal direction. In order, therefore, to determine the whole amount of this force, observations, of the kind above alluded to, must be combined with others on the dip. This third series accordingly was instituted at twenty-three different stations in Ireland, and the result arrived at was, that the lines of absolute intensity make an angle of 33° 40′ with the meridian of Dublin, and that the intensity increases in a direction perpendicular to these lines by the 1-100th part for every ninety-five miles of distance.

The importance of these researches in extending our knowledge of Terrestrial Magnetism, and affording the data on which a correct theory with respect to this subject may hereafter be based, will be felt even by those who do not fully appreciate the skill and labour they required, and no better proof could be afforded of the substantial benefits arising from such an institution as the British Association, than that of having originated such an inquiry.

On the subject of Heat, Dr. Hudson, of Dublin, has detailed some experiments, the tenor of which he considers incompatible with the commonly received theory respecting its radiation, which we owe to Professor Prevost, of Geneva, inasmuch as their tendency would be to establish that cold is equally radiated with heat—a result inconsistent with the notion of the former being a negative quality. He, consequently, leans rather to the views of Professor Leslie, who supposed heat to be radiated in consequence of the alternate expansion and contraction of the air around, producing a series of aerial pulses.

In compliance with a wish expressed by the Meteorological Committee, Dr. Apjohn has investigated the theory of the Wet-bulb Hygrometer, and communicated an account of his experiments on this subject at the Dublin meeting. His paper, having been already published in the Transactions of the Dublin Academy, does not appear in our Report, which, however, contains two very interesting communications on subjects of Meteorology.

Mr. Snow Harris has presented a statement of the variations of the thermometer at the Plymouth Dock-yard, as noted down by the wardens and officers of the watch, during every hour of the day and night, commencing on the 1st of May, 1832, and terminating in December, 1834, which are also checked by a concurrent series of thermometrical observations, registered every two hours, at the request of the Association, by the late lamented Mr. Harvey.

Thus have been afforded us, for two complete years, observations to contrast with those taken during 1834 and 1835, at Leith Fort, under the superintendence of the Royal Society of Edinburgh.

Mr. Snow Harris has deduced from an average of these observations the following important results:—

1st. The mean temperature of various seasons, as well as that of the entire year.

2d. The daily progression of temperature.

3d. The two periods of each day at which the mean temperature occurs.

4th. The relation between the mean temperature of the whole twenty-four hours, and that of any single hour.

5th. The average daily range for each month.

6th. The form of the curves described by the march of the temperature between given periods of the day and night.

In this manner has been accomplished one of the first undertakings suggested by the British Association to its members, and promoted by its funds, and the true form of the diurnal and annual curves in an important station of our southern coast been attained, as a standard of comparison with that arrived at by Sir David Brewster in the latitude of Edinburgh, and from which they exhibit in the results some extremely curious and important discrepancies.

Professor Phillips and Mr. Gray have presented us with a continuation of those curious observations on the Quantities of Rain falling at different elevations, which had formed the subject of two preceding communications published in these Transactions.

In the first series of these it had been shown that the difference between the quantities of rain that fell depended on two conditions—1st. The height, and, 2dly. The temperature; the former circumstance determining the *rate* of the difference between the two stations, and the latter its *amount*.

In the second series he showed that the ratio likewise varied at different seasons.

The present or third series presents us with a formula for expressing these variations, and points out its correspondence with the observations made.

That the quantity of rain which falls should be greater at lower than at higher elevations, is a result which, though at first sight it may appear paradoxical, is quickly perceived to harmonize with the fact, that drops of rain descend from a colder to a warmer atmosphere, and, consequently, condense a portion of the aqueous vapour which exists suspended in the lower strata. But that the rate of increase should actually be found reducible so nearly to a mathematical formula, is certainly far more than could have been expected, and its successful accomplishment is calculated to give us hopes that other meteorological phenomena, which seem at present so capricious as to baffle all calculation, may at length be found reducible to certain fixed principles. So far as relates to the rain that falls at York, the results are regarded by Professor Phillips as sufficiently complete, but he strongly urges the advantage of instituting in other spots selected in different parts of the kingdom similar observations, which, if executed simultaneously, would mutually illustrate each other, and be likely to throw much additional light on the theory of rain, and on the distribution of vapour at different heights.

An important practical paper has been published in our Transactions of this year, by Mr. Eaton Hodgkinson, on the effect of impact upon beams. It is a continuation of some researches which he communicated at the preceding meeting, on the collision of imperfectly elastic bodies. In these experiments he had laid down the general principles relating to the collision of bodies of different natures, and had obtained, amongst other results, the following—namely, that all rigid bodies possess some degree of elasticity, and that amongst bodies of the same class the hardest are generally the most elastic.

It remained to be seen whether this difference in elasticity influenced the force of their impact, and this he has shown in his present memoir not to be the case, the hardest and most elastic substances producing no more effect upon a beam than any soft inelastic body of equal weight. Various other conclusions of much practical, as well as theoretical, importance are stated in the above paper, and the results are severally borne out by an elaborate and careful series of experiments.

Our Foreign Associate, Mons. Quetelet, has presented to us a sketch of the progress and actual state of the Mathematical and Physical Sciences in

Belgium, of interest, not only from the information it conveys, but likewise as the contribution of a distinguished foreigner, who had evinced already his respect for this Association, by attending one of its meetings. The appearance of this Report, together with that published in the preceding volume by Professor Rogers, of Philadelphia, on the Geology of North America, I regard as a new proof of our prosperity. It shows that the Association has begun to exert an influence over the progress of science, extending even beyond the sphere which, by its name of British, it claims for its own, and that it has enlisted in its behalf the sympathies, not only of our Transatlantic brethren, who speak the same language, and boast of a common extraction, but likewise of those continental nations from whom we had so long been severed.

On the subject of Chemistry our Transactions of this year contain only a short report by Dr. Turner, explanatory of the sentiments of the members of the committee which had been appointed the preceding year, to consider whether or not it would be possible to recommend some uniform system of Notation, which, coming forward under the sanction of the most distinguished British chemists, might obtain universal recognition. In the discussion which took place when this subject was brought before us at Dublin, three systems of Notation were proposed, differing one from the other, no less in principle, than in the end proposed by their adoption;—the first was that suggested by the venerable founder of the Atomic Theory, Dr. Dalton, who aimed at expressing by his mode of notation, not merely the number of atoms of each ingredient which unite to form a given compound, but likewise the very mode of their union, the supposed collocation of the different atoms respectively one to the other. He proposed, therefore, a sort of pictorial representation of each compound which he specified, just as in the infancy of writing, each substance was indicated, not by an arbitrary character, but by a sign bearing some remote resemblance to the object itself. This, therefore, may be denominated the Hieroglyphical Mode of Chemical Notation; it was of great use in the infancy of the Atomic Theory, in familiarizing the minds of men of science to the mode in which combinations take place, and thus paved a more ready way to the reception of this important doctrine. Even now it may have its advantages in conveying to the mind of a learner a clearer notion of the number and relation of the elements of a compound body one to the other; and in those which consist only of two or three elements; a symbolic representation after Dr. Dalton's plan might be nearly as concise as any other. But it would be difficult, consistently with brevity, to express in this manner any of those more complicated combinations that meet us in every stage of modern chemical inquiry, as, for instance, in the compounds of Cyanogen, or in proximate principles of organic life.

The second mode of Notation is that in which the method adopted in Algebra is applied to meet the purposes of Chemistry. This method, whilst it is recommended by its greater perspicuity, and by its being intelligible to all educated persons, has the advantage also of involving no hypothesis, and being equally available by persons who may have taken up the most opposite views of the collocation of the several atoms, or who dismiss the question as altogether foreign to their consideration. This, therefore, may be compared to the alphabetical mode of writing in use amongst all civilized nations; the characters indeed may differ, the words formed by a combination of these characters may be very various, but the principles on which they are put together to express certain sounds and ideas are in all countries the same.

The third method of Notation, which has been recommended by the authority of several great continental chemists, and especially of Berzelius, resembles rather a system of short-hand than one of ordinary writing; its express object being to abbreviate, so far as is consistent with perspicuity, the mode of Notation last described. But although most chemists may find it convenient to employ some of these abbreviated forms of expression, it seems doubtful whether any particular amount of them can be recommended for general adoption, since the necessity for it will vary according to the habits of the individual, the nature of his inquiries, and the objects for which his notes are designed.

A chemist, for example, the character of whose mind enables him quickly to perceive, and clearly to recollect minute distinctions, may find a much more abbreviated style of notation convenient than would be at all advisable to others; one who is engaged in the analysis of organic compounds will be more sensible of the utility of such symbols than another who is conversant chiefly with a less complicated class of combinations; and one who notes down the results of his experiments for the benefit of private reference, and not with any immediate view to others, may indulge in a more concise and complex system of notation than would be convenient, where either of the latter objects were contemplated.

As the shortest road is proverbially not always the most expeditious, so in Chemical Notation more time may often be lost in correcting our own blunders and those of the compositor, where dots and commas of many sorts are introduced in the place of initial letters to express certain elements, than was gained by the more compendious method of expression employed. Add to which, in the preference given to one set of dots over another, or in the particular collocation of them, above, below, or at the side of the symbol to which they are referred, we have no fixed principle to guide us, and can therefore only be determined by the greater or less frequent adoption of one method than of another.

Perhaps, therefore, all that can be hoped from a committee of British chemists would be, to set forward the various uses of some system of Chemical Notation, the purposes for which each of those brought before them seems chiefly applicable, and the degree of prevalence which one has obtained over the rest.

If I may be allowed to offer my own humble opinion on a point which has been so much debated amongst British chemists, I should remark, that for the purpose of rendering more intelligible to beginners the mode in which various bodies are supposed to combine, the Daltonian method of Notation may still be of use, just as pictorial representation often comes in aid of verbal description to convey the idea of a complex object: but that where the design is to state in the clearest, and least hypothetical terms, the nature of a series of combinations, a mode of notation as closely as possible approaching to that adopted in algebra seems preferable—remembering always, that as in algebra we omit certain signs for the sake of greater brevity, so it may be allowable to do in applying its principles to chemistry, these abbreviations being of course the most advisable in cases where, by reason of the greater number of elements involved, the expression of them at whole length would occupy so much space as to prevent the whole from being comprehended at a glance.

The above remarks will not, I believe, be found inconsistent with the spirit of the brief report which Dr. Turner has communicated, and which is to the following effect:—

1st. That the majority of the Committee concur in approving of the employment of that system of Notation which is already in general use on the continent, though there exist among them some difference of opinion on points of detail.

2dly. That they think it desirable not to deviate in the manner of notation from algebraic usage, except so far as convenience requires.

And, 3dly. That it would save much confusion if every chemist would state explicitly the exact quantities which he intends to represent by his symbols.

(To be continued.)

ROYAL GEOLOGICAL SOCIETY OF CORNWALL.

The annual meeting of this society was held on the 2d September,

D. GILBERT, D.C.L., F.R.S., &c., President, in the chair.

Beside the usually most respectable attendance of the gentry of the neighbourhood, among whom we noticed Sir Charles Lemon, Bart., M.P., Rev. Canon Rogers, W. M. Tweedy, G. Croker Fox, R. Were Fox, Alfred Fox, John Borlase, Geo. S. Borlase, Edward Bolitho, John Scobell, Samuel Borlase, D. P. Le Grice, and James Halse, M.P., Esquires; Reverends C. V. Le Grice, H. Penneck, John Punnett, R. M. N. Peters, &c., there were also present the following, among other distinguished visitors:—The Right Rev. the Lord Bishop of Exeter, Rev. Dr. Buckland, Rev. Professor Powell, Professor Johnston, H. T. De la Beche, Esq., foreign secretary of the Geological Society of London, Rev. E. Stanley, F.G.S., — Turner, Esq., of Liverpool, and many others.

The communications of the officers, Dr. Boase and Mr. Henwood, were briefly disposed of, in order that the distinguished philosophers present might have an opportunity of explaining their views on the several subjects.

Mr. De la Beche exhibited those portions of the ordnance map of the county, which he has already coloured geologically, and explained his views of some of the phenomena. The patches of granite he imagined to be protruded through the slate, which had been previously deposited, and the veins (lodes, cross-courses, &c.) he believes to be of more recent formation. He then spoke of some beautiful trap dykes cutting through the fossilferous slates near Newquay, and concluded a brief but most instructive communication by a well-merited compliment to the accuracy of detail and patient research exhibited by Dr. Boase, in his descriptions of the geology of Cornwall.

Mr. Robert Were Fox having been called on by the President, explained his views of the origin of metalliferous veins, which he thought to be by a slow cracking or opening of the strata, which he assumed to be produced by electric agency, developed by the contact of rocks of different kinds; and cited his well known and ingenious experiments on the electricity of veins which now exist. He then exhibited some varieties of copper ore, all which we understood him to say were produced from the common yellow copper ore by some simple galvanic agency. Among them were native copper, carbonate of copper, oxide of copper, vitreous copper ore, and purple copper ore.

Dr. Buckland, after complimenting Mr. Fox very highly on his beautiful and valuable discovery, said that it would go down to posterity with the discoveries of Newton, with whom Mr. Fox would be for ever associated. Until March last, said the eloquent professor, we were all in the dark on the subject of mineral veins—it was the "terra incognita" of geology—but Mr. Fox has illuminated and revealed to us the laboratory of Nature; and her secret operations are now as familiar and intelligible as the commonest and most simple experiments.

In a subsequent stage of the proceedings, the reverend and learned professor gave a most luminous and interesting lecture on some splendid specimens of the ichthyosaurus (a gigantic species of lizard now extinct), which had been presented to the society from the neighbourhood of Glastonbury, by Joseph Parker, jun., Esq. The portion which related to the eye, Doctor Buckland showed, was adapted, by its enormous size, to collect as much light as possible in the animal's abode, the depths of the ocean; by its telescopic vision, which it possessed the power of rendering microscopic, it was enabled either to see its prey at a great distance or to detect the minutest molusca; and as its masticating apparatus was defective, it must have "bolted" its food at a gulp, and therefore required the ability to place itself most conveniently for seizing it.

In moving votes of thanks to the distinguished visitors, some admirable addresses were delivered by Mr. Tweedy, Dr. Boase, the Rev. J. Punnett, and the Rev. C. V. Le Grice.

From the treasurer's report, it appears that the receipts of the society for the year ending September 2, 1836, amount to 220*l.* 5s. 5d., and the disbursements to 83*l.* 16s. 9d., leaving a balance in favour of the society of 136*l.* 8s. 8d.

The report of the council being read, it was resolved, that it be printed and circulated among the members; and that the thanks of the society be presented to the authors of the various communications; to the donors of minerals, books, &c.; and to the officers of the society.

The President then announced that the following gentlemen had been elected since the last report:—Corresponding member, Joseph Parker, jun., Upton Cheyney, Gloster. Ordinary members, the Right Rev. the Lord Bishop of Exeter; B. Pidwell Batten, Penzance; J. G. Beckerleg, Penzance; D. B. Bedford, Penzance; Rev. H. E. Graham, Ludgvan; J. H. B. Gurney, Penzance; Samuel Higgs, Penzance; Richard Millett, Penzance; James Pascoe, Penzance; Samuel Pidwell, jun., Penzance.

At the conclusion of the meeting, the President informed the company that, on the morrow (Saturday) morning, vehicles would be provided to convey such of them as were disposed to some of the most interesting geological phenomena of the neighbourhood. Accordingly, about twenty or thirty ladies and gentlemen visited Polmear Cove, in Zennar; who, on their return, expressed themselves highly delighted with their excursion.

TWENTY-THIRD ANNUAL REPORT OF THE COUNCIL.

During the past year considerable additions have been made to the museum and library, and the funds of the society continue in a prosperous state: but the council have the painful duty to report that the quarterly meetings have been discontinued, in consequence of the uniform non-attendance of the members. This is the more to be regretted because these meetings, if properly supported, might have been the means of exciting a more general taste for geological pursuits; and it is to be hoped that the attempt which will be made, during the ensuing year, to revive them, will be more successful, as your council feel assured that such meetings will greatly tend to promote the welfare of the society.

The publication of the Transactions in annual parts has been again brought before the council, and has been strenuously advocated as a measure which would insure the more frequent communication of valuable memoirs. The papers already laid before the society will appear in the fifth volume, which it is expected will be finished against the next anniversary: and the council recommend the immediate publication of such as may be hereafter presented, in the hope that such a regulation may elicit a more abundant supply of scientific communications than has been received on the present occasion.

The council, however, whilst regretting the inactivity of the society during the past year, have great satisfaction in being able to state that considerable progress has been made towards the attainment of a more accurate knowledge of the geological structure of Cornwall, by the able and indefatigable labours of Mr. De la Beche, who has kindly acceded to their request of giving the members some information concerning the result of his investigations.

The following papers have been read since the last report:—

I. A chemical examination of a peculiar substance incrusting the roof of a cavern in Cornwall. By Henry S. Boase, M.D., secretary of the society.

II. On Slickensides, and whether they afford evidences of mechanical origin. By W. J. Henwood, F.G.S., Lond. and Paris, Hon. M.Y.P.S., assay master of tin in the Duchy of Cornwall, Curator of the museum.

III. On a granite vein, and the phenomena which accompany it, at Polmear Cove. By Henry S. Boase, M.D.

IV. On periodical variations in the quantities of water afforded by springs. By W. J. Henwood, F.G.S., Cor. Mem. Plymouth Institution.

V. An account of the quantity of tin produced in Cornwall and Devon, in the year ending with the Midsummer quarter, 1836. By Joseph Carne, Esq., F.R.S., F.G.S., M.R.I.A., &c., treasurer of the society.

VI. An account of the quantity of copper produced in Great Britain and Ireland, in the year ending the 30th June, 1836. By Alfred Jenkin, Esq.

The curator's report gave a list of the several donations to the museum and library, but which, for a society possessing so many local advantages, must be considered very limited.

Among the various scientific works presented to the society is a paper by the Rev. Prof. Sedgwick, F.R.S., on the general structure of the Cambrian mountains, &c.

The quarterly meetings of the society for the ensuing year will be on Fridays,—the 22d January, the 21st April, and the 21st July, at seven o'clock in the evening.

ROYAL CORNWALL POLYTECHNIC SOCIETY.

The fourth annual meeting and exhibition of this society was held at Falmouth last week, in the New-hall, built expressly for the society's use.

The company consisted of gentlemen interested in the mines, and a considerable number of ladies from different parts of the county. Davies Gilbert, Esq., vice-patron of the society, presided; supported on the right by Sir Charles Lemon, Bart., M.P. for West Cornwall, accompanied by Lady Paget, and some ladies of his family; and on the left by the Rev. Dr. Buckland, professor of geology in the university of Oxford; the Rev. Professor Powell, of Oxford; H. T. De la Beche, Esq., F.G.S.; Dr. Wilson, of the London University; Professor Wheatstone, of King's College; Professor Johnston, of Durham University. There were also present Robert Were Fox, Esq.; John Williams, jun., Esq., F.R.S.; J. S. Enys, Esq.; W. J. Henwood, Esq., F.G.S., and other gentlemen who have distinguished themselves in the walks of science, besides a great number of ingenious mechanics, practical miners, &c., several of whom were competitors for the rewards of the society.

The Chairman, in his opening address, adverted to the circumstance of the Duchess of Kent and the Princess Victoria having consented to patronise the society, requesting Sir C. Lemon to read the letter on the subject; he then remarked on the increased honours won to the county, by the philosophic experiments of R. W. Fox, Esq., whose communication to the British Association lately held at Bristol had excited so much general admiration and attention.

Mr. Fox, having been requested to repeat some of his statements and experiments, did so, much to the satisfaction of the many scientific persons standing around the platform.

After Mr. Fox had thus added to the interest of the meeting, Dr. Buckland, in a masterly manner, adverted to many subjects highly interesting to geologists and practical miners; and bestowed great praise on many of the ingenious competitors on this occasion, especially noticing Mr. Phillips's plan for raising men from the mines, and letting them down without loss of time or waste of physical energy.

The doctor, with other members of the British Association, were admitted honorary members of the institution; and Professor Powell and Mr. De la Beche returned thanks.

The President then, aided by the secretaries, awarded the prizes.

The following is a list of the principal premiums and prizes awarded on this occasion:—

PREMIUMS.

The premium offered by E. W. W. Pendarves, Esq., for the best practical method of ascertaining the quantity of water raised by each lift of pumps in the mines of this county, was awarded to Mr. John Phillips, of Halsetown.—An extra reward of 3*l.* was given by the society to Mr. John Arthur, of Perran Foundry, for a model for the same purpose; and another reward, of 2*l.*, to Mr. Hocking, of Consols, for the same object.

The premium of seven guineas, offered by John Taylor, Esq., for the most complete and accurate accounts of the quantity of water supplied to the boiler, the number of bushels of coal consumed, and the duty performed by any engine for a period of not less than six months in the past year, was awarded to Messrs. Hocking and Loam, of Consols Mines.

A bronze medal was awarded to Mr. Richard Laayon, surgeon, of Redruth, for a paper sent in to compete for the premium offered by G. C. Fox, Esq., for the best essay on the various diseases incidental to miners. The premium of course remains open for competition.

A reward of 3*l.* was given by the society to Mr. John Phillips, for the plan submitted by him to compete for the premium offered by J. H. Tremayne, Esq.

NATURAL PHILOSOPHY.

Judges—Sir C. Lemon, Dr. H. S. Boase, W. J. Henwood, R. W. Fox, H. T. De la Beche, and W. M. Tweedy, Esqrs.

Meteorological Register, Mr. L. Squire, jun.—1st prize.
Ditto Mr. Jonathan Couch, F.L.S.—2nd prize.

MECHANICAL AND OTHER INVENTIONS.

Judges—J. S. Enys, W. J. Henwood, G. S. Borlase, A. Fox, N. Harvey, W. West, James Simms, Davies Gilbert, Esqrs.; Captain T. Lean, Captain John Richards, Captain W. Richards, and Messrs. Loam, Goffe, and R. Hosking.

Invalid Bed, John Reynolds—1st bronze medal.
Dialling Instrument, John Phillips—1st bronze medal.
Dial, Captain T. Lean—2d bronze medal.
Improved Floor Clamp, Charles Bennett—Prize.

DRAWINGS AND MODELS, &c. OF MACHINERY, NOT DISPLAYING INVENTION.

Model of a Carpet Loom, E. Kerken—2d bronze medal.
Double-barrelled Gun, J. Lobb—Prize.
Miniature Steam-Engine, J. Michell—Prize.
Compensating Pendulum, J. Webber—Prize.
Model of a Steam-Engine, W. Tresise—Prize.
Single-barrelled Gun, J. Dimble—Prize.

ENTOMOLOGICAL SOCIETY.

A meeting of this society was held on Monday, the 5th inst., when an interesting conversation took place on the ravages of a species of aphis, described as a new blight by the market-gardeners of Covent-garden and the vicinity of the metropolis, attacking the cabbage and brocoli plants. In the course of the observations, it was stated that the best remedy that had been proved was equal parts of an infusion of tobacco and lime-water, frequently ejected over the plants. Some account was also given of the new silkworm, recently introduced to the notice of the members; and a memoir was read upon some Indian insects, in a letter addressed by Mr. Benson to Mr. Kirby.

MINE AND MINING.

Mine is a term applied to works carried on underground, for obtaining minerals generally, but chiefly for metallic ores. The internal parts of the earth, as far as they have been investigated, consist of various strata or beds of substances, extremely different in their appearances, specific gravities, and chemical qualities, from one another. Neither are these strata similar to one another in different countries; and in one district, the strata varies considerably in its nature, at very short distances apart. Rocks of most kinds are traversed in every direction by cracks or fissures, having, in many instances, the appearance of those formed in clay and mud while gradually becoming dry in hot weather. These fissures are in general filled with substances formed of materials differing from the rocks in which they are situated. When they contain minerals partly composed of any kind of metal, they are called metallic *veins*, *lodes*, or *courses*. Metallic veins are only found in what are called the primitive rocks, as granite or slate: and, in general, their course is from east to west. A vein rarely consists of metal in a pure and malleable state, but is almost always found in chemical combination with other substances; in this state it is called an ore, the metal of which is separated by the process called *smelting*, which is, in fact, a melting-out of the metal from its combinations, usually effected by the addition of such foreign substances as will, by their chemical affinities, assist in the separation of the metal. The thickness, extent, and direction of a vein of metal, depends on many circumstances; in general, its course downwards is in a slanting direction, more or less inclined; if it continues in a straight line, and of a uniform thickness, it is called a *rake*; if it occasionally swells out in places, and again contracts, it is termed a *pipe-vein*, and the wider parts of the vein are called floors: sometimes the vein divides itself into branches, and then it is said to *take horse*; in other cases a cross grain will interfere with it, and heave or lift it, as it were, from ten to twenty feet out of its course. At times it will be reduced to a mere thread, and at last become completely obliterated, appearing again at a distance. In many of these cases the difficulty of tracing these precious deposits through their rocky labyrinths must be evident. In all probability, however, the metals were at first procured from detached fragments of the ores, such as had been separated from the upper parts of the veins in which they were originally deposited; and in this manner is gold yet procured, by washing the sands of certain rivers. The pursuit of these scattered pieces of ore would naturally conduct the persons thus employed to the beds from which they had been detached, and in turning over the soil to procure the loose fragments, the backs of the veins would be laid open and discovered.

The tin of Cornwall was the first metal sought after in Britain of which we have an historical account; but the traces of the most ancient tin-works exhibit no symptoms of their having been pursued but in situations where the soil with which it was mixed could be easily removed, or where the ore could be laid bare by conducting over it streams of water to carry off the lighter parts of the soil. Lead is often found near the surface of the earth, and as the ores generally exhibit a metallic appearance, that metal was probably an early object of pursuit; but it was not until machines were invented to pump away the waters, and until gunpowder had furnished the means of splitting the hardest rocks, that man was enabled to penetrate strata of every description that opposed his progress. These inventions, therefore, form most important epochs in the history of mining. The hammer and wedges were probably the first instruments employed for splitting rocks, and the pick followed, which is used both as a hammer and a wedge. Previously to the use of iron, wedges of dry wood were made use of by driving them into clefts of the rock, and then wetting them, so as to cause them to swell and force the parts asunder. The means employed for raising up the minerals to the surface were at first extremely rude. The windlass and bucket may be reckoned an improvement which took place in a later stage of mining. This simple mechanism had its origin in Germany; but making successive stages, upon each of which men were placed, who raised the excavated matter from one to the other until it reached the top, in the same manner as is now commonly practised in digging out the foundations for houses, or for making deep drains. In South America the ores are for the most part carried up by the Indians; and where the situation admits of sloping roads, on the backs of mules. To Germany may also be traced the introduction of hydraulic machines for raising the water constantly collecting in the mines. Pumps were adapted to the shafts, and their constant action secured by giving motion to their pistons by wheels turned by descending streams of water. To England, however, belongs the merit of having greatly improved the pump-work and the water-engines to their present effective condition; and by the subsequent application of the steam-engine to this purpose, the mining processes of our countrymen have so far surpassed those of other countries, as to render their adoption indispensable in most situations.

Although copper is now the greatest metallic product of the county of Cornwall, it is comparatively, to the other metals, of modern discovery, not having been worked longer than a century. The reason assigned for its having so long remained concealed, is the assumed fact, that copper generally occurs at a much greater depth than tin; and that, consequently, the ancients, for want of proper machinery to drain off the water, were compelled to relinquish the metallic vein before they reached the copper. It is stated by Pryce in his *Mineralogia Cornubiensis*, as a general rule, that tin seldom continued rich and worth working lower than fifty fathoms; but of late years the richest tin mines of Cornwall have been much deeper. Trevenen mine was 150; Hewas Downs, 140; Poldice, 120; and Huel Vor is now upwards of 130 fathoms in depth. Upon the first discovery of copper ore, the miner, to whom its nature was entirely unknown, gave it the name of *poder*; and it will be hardly credited in these times, when it is stated that he regarded it not only as useless, but upon its appearance was actually induced to abandon the mine: the common expression upon such an occasion was, "that the ore came in and spoilt the tin." About the year 1735, Mr. Coster, a mineralogist of Bristol, observed this said poder among the heaps of rubbish; and seeing that the miners were wholly unacquainted with its value, he formed the design of converting it to his own advantage, and accordingly entered into a contract to purchase as much of it as could be supplied. The scheme succeeded, and Coster long continued to profit by Cornish ignorance. Besides tin and copper, some of the Cornish mines yield cobalt, lead, and silver. The ores are in veins or lodes, the most important of which run in an east and west direction: during their course they vary considerably, in width from that of a barleycorn to thirty-six feet; but the average may be stated at from one to four feet. The number of mines usually at work in Cornwall, is estimated at about 130.

The mines of Cornwall and Devon are generally worked by a company of proprietors, called adventurers, who agree with the owner of the land, or the lord of the soil, as he is usually denominated, to work the mine for a certain

number of years, paying him, by way of rent, a proportion of the ores raised, or an equivalent in money. The grant thus made to the adventurers is called a *set*, and the lord's rent, if paid in ore, is said to be the lord's *dish*; if paid in money, his *dues*. The adventurers divide their undertaking into shares of different magnitude, the smallest usually held being one sixty-fourth part. Any part of the concern held by one person is called a *dole*, and its value is known by its being denominated an eighth-dole, a sixteenth-dole, &c. The bounds or limits of a mine are marked on the surface by masses of stone pitched at equal distances; but the property of the soil above is entirely distinct from that part of the mine beneath it; the miner, however, has the privilege of making openings or shafts at stated intervals, for the purpose of raising the ore, and admitting air to the works. In opening a new mine, considerable knowledge of the country, and of the most likely situation of the metallic veins, is of course necessary to avoid the chance of useless labour. The spot for commencing operations having been selected, a perpendicular pit or *shaft* is sunk, and at the depth of about sixty feet a horizontal gallery or *level* is cut in the lode by two sets of miners, working in opposite directions, the ore and materials being raised in the first instance by a common windlass. As soon as the two sets of miners have cut or *driven* the level about 100 yards, they find it impossible to proceed for want of air; this being anticipated, two other sets of men have been sinking from the surface two other perpendicular shafts to meet them; from these the ores and materials may also be raised. By thus sinking perpendicular shafts, a hundred yards from each other, the first level or gallery may be carried to any extent. While this horizontal work is going on, the original, or as it is termed, the *engine-shaft*, is sunk deeper; and at a second depth of sixty feet, a second horizontal gallery or level is driven in the same direction as the first, and the perpendicular shafts are all successively sunk down to meet it; in this manner galleries continue to be formed at different depths, as long as the state of the lode renders the labour profitable. The engine shaft in the mean time is always continued to a greater depth than the lowest *level*, for the purpose of keeping the working shafts free from water. The object of these perpendicular shafts is not so much to get at the ores, which are directly procured from them, as to put the lode into a state capable of being worked by a number of men; in short, to make what is termed a *mine*. It is evident that the shafts and galleries divide the rock into solid right-angled masses, each 300 feet in length, and sixty in depth. These masses are again subdivided by small perpendicular shafts into three parts; and by this arrangement the rock is finally divided into masses called *pitches*, each sixty feet in height, and about 100 feet in length.

In the Cornish mines, the sinking the shafts, and driving the levels, is paid for by what is termed *tutwork*, or task-work, that is, so much per fathom; in addition to this the miners receive a small per centage on the ores, in order to induce them to keep the valuable portions as separate as possible from the *deads*, or rocky parts of the mass.

In addition to these horizontal and perpendicular shafts, another description of gallery is formed, called an *adit*: the use of this shaft is to drain the water from the lower parts of the mine. Where the mine is formed in an exposed rock, as in the Botallack mine, in Cornwall, the adit can carry off the water without the aid of machinery, as long as the lowest shaft is above the level of the sea; but when the shafts are sunk below that level, or that of the adit itself, recourse must be had to the assistance of steam-engines to pump up the drainage to a sufficient height. The great Cornish adit, which commences in a valley near Carnon, receives branches from fifty different mines in the parish of Gwennap, forming altogether an excavation nearly thirty miles in length. The longest continued branch is, from Cardrew mine, five and a half miles in length; this stupendous mine emptics itself into Falmouth harbour.

The lode, when divided as above described, is open to the inspection of all the neighbouring miners in the country, and each mass or compartment is let by public competition for two months, to two or four miners, who may work it as they choose. These men undertake to break the ores, and raise them to the surface, or, as it is termed, *to grass*, and pay for the whole process of dressing the ores, that is, preparing them for market. The men by whom the mines are worked in this manner are called *tributers*, and their share of the value of the ore, which varies according to its richness in metal, is named *tribute*. This tribute is paid over to them every week, the mineral being disposed of at a *ticketing*, or weekly sale. In addition to the working miners, a set of men, whose experience entitle them to the office, are engaged at a stated salary, to act as overlookers, and direct the labours of the rest; those whose business lies in the mines are called *under-ground captains*, and those employed above ground *grass captains*. The weekly produce of the mine being made up by the tributers into heaps of about one hundred tons each, samples, or little bags, from each heap are sent to the agents for the different copper companies. The agents take these to the Cornish assayers, a set of men, who (strange to relate) are destitute of the most distant notion of the theories of chemistry or metallurgy, but who, nevertheless, can practically determine, with great accuracy, the value of each sample of ore. As soon as the agents have been informed of the assay, they determine how much a ton they will offer for each heap of ore at the weekly ticketing. At this meeting all the mine agents, as well as the agents for the several copper companies, attend, and it is singular to see the whole of the ores, amounting to several thousand tons, sold without the utterance of a single word. The agents for the copper companies, seated at a long table, hand up individually to the chairman a ticket or tender, stating what sum per ton they offer for each heap. As soon as every man has delivered his ticket, they are all ordered to be printed together, in a tabular form. The largest sum offered for each heap is distinguished by a line drawn under it in the table, and the agent who has made this offer is the purchaser.

In order to prepare copper ores for market, the first process is to throw aside the rubbish, with which they are unavoidably mixed; this task is performed by children. The largest fragments of ore are then *cobbed*, or broken into small pieces by women, and after being again picked, they are given to what the Cornish miners term *maidens*, that is, young girls. These maidens *buck* the ores, that is, with a bucking-iron, or flat hammer, they break them into pieces not exceeding half an inch in size. The richest parts of the ore, which are more easily broken, are now crushed smaller in a kind of mill. The coarser portions, which are the hardest, are bruised in a *stamping-mill*, in which heavy weights or hammers are lifted by cams on a revolving shaft, and allowed to fall upon the ore, a stream of water constantly passing through the mass, and washing away the portion which is sufficiently reduced to pass through the holes made in an iron plate, which forms one side of the box in which the stampers work.

The next operation is that of *jigging*; this used to be performed entirely by boys, and consists in shaking a quantity of bruised ore in a kind of sieve, with an iron bottom to it, while under water. This occasions the heavier parts, which consist almost entirely of metal, to sink to the bottom; while the earthy matter is washed away, and the small fragments of stone, being lighter than the metal, and containing little or no ore, are left on the surface in the sieve; these are carfully skimmed off with the hand, and the remainder is piled up in heaps for sale. This process has been recently considerably improved by Mr. Thomas Petherick, a mine-agent, of Penpellick, who took out a patent in 1830, "for machinery for separating copper, lead, and other ores from earths and other substances with which they are and may be mixed, and is more particularly intended to supersede the operation now practised for that purpose, commonly called jigging." This machinery is thus composed; namely, a large vat or tub, with a fixed cover, in which cover are apertures and receptacles adapted to the form and size of a number of sieves, such as are used in the operation of separating copper, lead, and other ores, from the substances with which they are usually mixed. The vat is filled with water, and the sieves with the minerals in them are placed in their receptacles, so as to be immersed in the water contained in the vat; the interior capacity of which communicates with the interior capacity of a hollow cylinder; into this a plunger or piston is fitted, which is moved alternately up and down within it, so as alternately to displace water therefrom, and force the same into the vat, and then withdraw water from the vat into the hollow cylinder; thus causing a sudden flux and reflux of the water through the sieves, which is continued until the required degree of separation of the earths from the ores is effected.

In the specification of a second patent, granted in 1832, to Mr. Petherick, in conjunction with Mr. Kingston, of Islington in Devonshire, for improvements in the patent machinery just described, it is directed that the aforesaid cylinder is to be provided with a bottom plate and foot valves, opening outwards to allow the escape of the water into the vat, but not to permit its return; and the piston is furnished with valves opening downwards to allow the water to pass through it in that direction, so that the motion of the piston shall cause the water to pass through the cylinder the same as in a common lifting water-pump. By this improvement, the water instead of being made to pass up and down through the sieves, containing the minerals, as in the previous plan, is forced through the sieves by a series of impulses varying in extent and intensity with the proportion of the area of the piston to the areas of the sieves, and the extent and rapidity of the motion communicated to the piston. The first mover of this machinery may be steam, or water, or horse, or man power, as circumstances may demand. It is proposed by the patentees as one modification of their plans, to carry a shaft from a first mover over a series of separating vats placed in a row, and made to actuate each piston, by means of a piston rod and crank connected with the main shaft. It is also proposed by the patentees in the specification of this second invention, to admit the water from an elevated reservoir into the sieve vat, instead of forcing it in by a pump, as in the first part. If there be a sufficient supply of running water, the elevated reservoir is to be kept constantly filled therefrom, and it is to be admitted into the vat and forced through the sieves, by means of a stop-cock or valve, in a series of impulses, actuated by an hydraulic pressure proportionate to the altitude of the reservoir. Where there is not a running stream for the supply of the elevated reservoir, the water is to be pumped up again for that purpose, after it has passed through the sieves. The stop-cocks or valves for the admission of the water from the reservoir to the vat, are to be opened and closed to produce the impulses, either by a boy operating with a lever, or by being connected with one of the pumps or water wheels, when such are used. The patented machinery of Messrs. Petherick and Kingston is, we are informed, in successful operation at the Lanescot and other Cornish mines.—*Hebert's Engineer's and Mechanic's Encyclopædia.*

THE NEW STANNARIES COURTS' ACT.

The following is a copy of this Act, which received the Royal Assent on the 20th of August, and which is entitled "an Act to make provision for the better and more expeditious administration of justice in the Stannaries of Cornwall, and for the enlarging the jurisdiction and improving the practice and proceedings in the Courts of the said Stannaries:"—

I. Whereas there has existed throughout the Stannaries of Cornwall a court in which the Vice-Warden has in certain cases, wherein tin or tinners, or matters connected with tin, are concerned, exercised original equitable jurisdiction; and whereas there has existed a court in each of the Stannaries of Cornwall, called the Steward's Court, and in which the Steward of the Stannaries has exercised a common law jurisdiction in such like cases: and whereas the jurisdiction so exercised by the Vice-Warden and the Steward respectively has been confined to cases wherein tin or tinners are concerned: and whereas in late times lead, copper, and other metals and metallic minerals than tin have been discovered in the county of Cornwall, and over the matters connected with the working for and purifying and smelting of which lead, copper, and other metals and metallic minerals such jurisdiction has not been considered to extend: and whereas the various persons in the said county, working and interested in such lead, copper, and other metals and metallic minerals, are greatly inconvenienced in their disputes in cases where such metals and metallic minerals other than tin are concerned, and are put to great inconvenience in obtaining redress therein: and whereas it is expedient to unite the court of equity of the Vice-Warden with the courts of common law of the Steward of the said Stannaries, and to extend the jurisdiction of the court to and over all metals and metallic minerals in the said Stannaries, and to and over all transactions connected therewith in the said county of Cornwall, in manner hereinafter mentioned; and also to confirm, alter, and enlarge the powers of such court in various particulars, and to make other provision than heretofore for the hearing of appeals and writs of error therefrom:—Be it therefore enacted, by the King's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, that from and after the death or resignation or other removal of the present Vice-Warden, it shall and may be lawful for the Duke of Cornwall for the time being, if of full age, or his Majesty and his successors, King or Queen Regnant of England for the time being, if there be no Duke of Cornwall, or if the Duke of Cornwall for the time being is under age, to nominate and appoint from time to time (by letters patent under the privy seal of the Duchy of Cornwall, or under the great seal of England, as the case may be) a fit person, being a barrister at law of five years standing at the least, to be and be called the Vice-Warden of the Stannaries.

II. And be it further enacted, that the present Vice-Warden and every future Vice-Warden shall be judge of the court hereinafter mentioned, and which shall have both a common law and an equity side, and shall comprehend the court heretofore the court of the Vice-Warden and the court heretofore the courts of the Stannaries, and that the Vice-Warden for the time being shall hold such office during his good behaviour: provided always, that it shall and may be lawful for the Duke of Cornwall for the time being, if of full age, or his Majesty and his successors, King or Queen Regnant of England for the time being, if there is no Duke of Cornwall, or if the Duke of Cornwall for the time being be under age, on a requisition to him for that purpose, stating therein at length sufficient grounds, and signed by the majority or five of the council, or of the commissioner or principal officers of the Duchy of Cornwall, but not otherwise (the Lord-Warden of the Stannaries being always one of the persons signing such requisition), to remove the person for the time being holding the said office of Vice-Warden.

III. Provided always, and be it enacted, that notwithstanding any thing herein contained, the appointment of Vice-Warden (should any vacancy occur during the time the present Lord-Warden of the Stannaries holds that situation) shall be in such Lord-Warden, subject nevertheless to all the provisions as to the qualification of the person to be appointed Vice-Warden, and his removal, as hereinbefore contained.

IV. And be it further declared and enacted, that the original equitable jurisdiction heretofore lawfully exercised by the Vice-Warden for the time being shall and may be henceforth exercised by the present and every future Vice-Warden for the time being, and that the present and every future Vice-Warden for the time being shall have, exercise, and enjoy the same equitable jurisdiction, and the same power and authority in all matters and things brought before him, so far as relates to the working, managing, conducting, or carrying on any mine worked for any lead, copper, or other metal or metallic mineral within the said county of Cornwall, or to the searching for, working, smelting, or purifying any lead, copper, or other metal or metallic mineral within the said county, in as full and ample a manner as if the same had related to any tin, or tin ore, or tin mine, or mine worked for tin, in the said county: provided always, that nothing herein contained shall be deemed or taken to affect any suit or matter now pending in any court of law or equity.

V. Provided nevertheless, and be it enacted, that all decrees, orders, and acts, as well already or hereafter to be made or done by the Vice-Warden for the time being, shall in each and every case be subject to be re-heard and varied by the Vice-Warden for the time being, according to the practice of the court, and that the Lord-Warden for the time being shall have full power and authority on any appeal or appeals presented to him for that purpose, within the time limited by the practice of the court (such appeal or appeals being left with the secretary of the Lord-Warden at the Duchy office), and with the aid and assistance of three or more members of the judicial committee of his Majesty's privy council for the time being, to affirm, alter, or reverse any decrees, orders, or acts already or hereafter made or done by the Vice-Warden for the time being, either in whole or in part, and to dismiss such appeal or appeals, with costs or otherwise, as may to the Lord-Warden so aided and assisted seem just: provided, that the judgment pronounced by the Lord-Warden so aided and assisted on any appeal or appeals presented shall be transmitted to the court of the Vice-Warden, to be by such court carried into effect, and shall be subject to appeal to the Lords Spiritual and Temporal in Parliament assembled.

VI. And be it further enacted, that the courts of law of the respective Stannaries, heretofore held before the Stewards or Steward thereof, shall be one court for all the Stannaries, and shall be held by and before the Vice-Warden for the time being, who as judge thereof shall have, exercise, and enjoy the same common law jurisdiction, and the same powers, privileges, and authorities with reference thereto, and shall transact, do, and perform the same duties, matters, and things in relation thereto, as have heretofore been lawfully transacted, done, performed, or to be exercised or enjoyed by the Steward for the time being of any of the Stannaries.

VII. And be it further enacted, that such Vice-Warden for the time being shall also have, exercise, and enjoy the same common law jurisdiction and the same power and authority in all matters and things that shall be brought before him in any way connected with the working, managing, conducting, or carrying on any mine worked for lead, copper, or any other metal or metallic mineral within the said county of Cornwall, or in any way relating to lead, copper, or any other metal or metallic mineral, or the searching for, working, smelting, or purifying lead, copper, or any other metal or metallic mineral within the said county, in as full and ample a manner as if the same had been connected with or related to any tin, or tin ore, or tin mine, or mine worked for tin in the said county: provided always, that it shall and may be lawful for either or any of the parties, plaintiff or defendant, against whom any judgment, or order, or sentence, shall be given to appeal therefrom to the Lord-Warden for the time being, and that the Lord-Warden for the time being shall have power and authority to receive appeals (the same to be lodged with his secretary at the Duchy office as aforesaid), from such judgments, orders, and sentences, and shall have power and authority, being aided and assisted by three or more members of the judicial committee of his Majesty's privy council for the time being, to hear such appeals, and to affirm, alter, and reverse such judgments, orders, or sentences, in whole or in part, or to dismiss the said appeals with costs or otherwise, as may be just: provided always, that a record of every judgment, order, or sentence pronounced by the Lord-Warden, so aided and assisted as aforesaid, and signed by such Lord-Warden, be remitted to the court of the Vice-Warden, to be by such court carried into effect, according to law: provided also, that upon any appeal from any judgment upon the verdict of a jury, the Lord-Warden, so aided and assisted as aforesaid, shall not reverse, alter, or inquire into the said judgment, except only for error of law apparent upon the record; and that every judgment of the Lord-Warden shall be subject to an appeal to the Lords Spiritual and Temporal in Parliament assembled.

VIII. And be it further enacted, that any party to any action at law brought in the said court may apply for a new trial in any such action to the Vice-Warden within eight days after the trial of such cause, if the said Vice-Warden shall be then sitting, or within the first four days of the next term, and the said Vice-Warden may grant a new trial upon any of the grounds on which new trials are now granted by the courts at Westminster, and upon such terms and conditions as by the said Vice-Warden shall be thought reasonable; and the said Vice-Warden, if he shall think that an impartial trial cannot be had in Cornwall, may direct that the nisi prius record on any cause shall be sent to the judges of assize for the county of Devon, who shall have authority to try such cause, and after the trial to cause such record to be transmitted to the court of the Vice-Warden, who shall proceed on the said record as if the cause had been tried in his own court: provided always, that the orders of the said Vice-Warden upon such application for a new trial shall be subject to such appeal as hereinbefore provided as to other decrees, orders, and acts of the said Vice-Warden.

IX. And be it enacted, that the service of every writ of subpœna to attend and give evidence, hereafter to be issued out of either side of the said court of the Vice-Warden, and served upon any person in any part of England or Wales, shall be as valid and effectual in law, and shall entitle the party suing out the same to all and the like remedies by action or otherwise howsoever, as if the same had been served within the jurisdiction of the said court of the Vice-Warden; and that in case the person so served shall not appear according to the exigency of such writ, it shall be lawful for the said court of the said Vice-Warden, upon oath or affirmation to be taken in open court, or affidavit, of the personal service of such writ, to transmit a certificate of such default under the seal of the said court to the Court of King's Bench at Westminster; and the said last-mentioned court may and shall thereupon proceed against and punish by attachment or otherwise, according to the course and practice of the same court, the person so having made default, in such and the like manner as the same court might have done if such person had neglected or refused to appear in obedience to a writ of subpœna issued to compel the attendance of witnesses out of such last-mentioned court.

X. Provided always, and be it further enacted, that the said Court of King's Bench shall not in any such case as aforesaid proceed against or punish any person, nor shall any such person be liable to any action, for having made default by not appearing to give evidence in obedience to any such writ of subpœna as aforesaid for that purpose, issued under the authority of this Act, unless it shall be made to appear to the said Court of King's Bench that a reasonable and sufficient sum of money to defray the expenses of coming and attending to give evidence, and of returning from giving such evidence, had been tendered to such person at the time when such writ of subpœna was served upon such person.

XI. And be it further enacted, that whenever a plaintiff or defendant in any action or suit in which judgment shall be recovered in the said court of the Vice-Warden shall remove his person or goods or chattels from or out of the jurisdiction of the said court of the Vice-Warden, it shall and may be lawful for any of the superior courts at Westminster, upon a certificate from the Registrar, under the seal of the said court of the said Vice-Warden, of the amount of final judgment obtained in any such action, to issue a writ of execution thereupon for the amount of such judgment, and the costs of such writ and certificate, to the sheriff of any county, city, liberty, or place, against the person or goods of the party against whom such final judgment shall have been obtained, in such manner as upon judgments obtained in any of the said superior courts at Westminster.

XII. And be it further enacted, that in case any rule of the said court of the Vice-Warden cannot be enforced by reason of the non-residence of any party or parties within the jurisdiction thereof, it shall be lawful, upon a certificate of such rule by the Registrar, under the seal of the said court of the said Vice-Warden, and an affidavit that by reason of such non-residence such rule cannot be enforced, to make such rule a rule of any one of the courts at Westminster, if such superior court shall think fit, and that thereupon such rule shall be enforced as a rule of such superior court.

XIII. And be it further enacted, that neither the Vice-Warden for the time being, nor the court of such Vice-Warden, shall have, use, or exercise any power or authority save as hereby provided, and that any person against whom proceedings shall be instituted in the court of the Vice-Warden shall, after the appearance entered, be at liberty to demur or plead to the jurisdiction of the said court; but that no question as to the jurisdiction of the said court with respect to the matters embraced in such proceedings shall hereafter be raised unless such person shall within fourteen days after appearance entered by or on behalf of himself, or entered by the person instituting such proceedings in manner hereby provided, demur or plead to such proceedings by filing a statement of the grounds of such demurrer or plea at the Registrar's office, and serving a copy thereof on the person instituting such proceedings, or his solicitor or attorney.

XIV. And be it further enacted, that the Vice-Warden for the time being shall have power and authority from time to time, and as often as circumstances shall require, to make and prescribe such rules and orders touching and concerning the forms and manner of proceeding in the court of the Vice-Warden, and the practice and pleadings in all matters to be brought therein, the appointing commissioners to examine witnesses, the taking of examinations *de bene esse*, and allowing the same as evidence, the process of the said court, and the mode of executing the same, the fees reasonable to be demanded by attorneys, solicitors, and others, and by the officers of the said court, for business by them transacted in the said court, and such other rules, orders, and regulations as shall from time to time seem necessary and proper for expediting the business of the said court with most convenience and at most reasonable expense to the parties concerned therein, and that the Vice-Warden for the time being shall have power to revoke, alter, and amend the rules, orders, and regulations so from time to time made; provided that the rules, orders, and regulations so at any time made by such Vice-Warden for the time being are not inconsistent with this Act, or any of the provisions herein contained, and that such of them as shall apply to the equity side of the said court be approved of by the Lord Chancellor of England, and that such of them as apply to the common law side of the said court be approved of by a judge of one of the superior courts of common law at Westminster; provided always, that such rules and orders when so approved, shall be transmitted to one of his Majesty's principal Secretaries of State, and be laid before both Houses of Parliament within one month from the making thereof, if Parliament be then sitting, or if Parliament be not then sitting, within one month from the commencement of the then next session of Parliament: provided nevertheless, that all rules, regulations, and orders, and all forms of practice, heretofore in use, and all fees heretofore authorized or accustomed to be taken in the court of the Vice-Warden for the time being, or in any of the courts of the Stannaries, shall (except so far as the same or any of them are hereby annulled, or are inconsistent herewith,) be and be considered binding and valid rules, regulations, and orders, and forms of practice and authorized fees, until the same be altered, amended, or revoked by virtue of the powers hereby given.

XV. And be it further enacted, that the Vice-Warden for the time being shall in all cases in equity brought before him, whether by bill, petition, or otherwise, have power and authority to take the whole or any part of the evidence therein, either *viva voce* on oath or affirmation before himself or before the Registrar, or before persons duly authorized by him for administering oaths and taking affidavits, or on depositions taken before the Registrar, or commissioners appointed for that purpose, or otherwise, as the Vice-Warden may from time to time direct, by any general rule to be made by virtue of this Act; provided always, that the said Vice-Warden for the time being may, on interlocutory matters, and in such other cases as to him shall seem desirable, receive evidence either, in whole or in part, on affidavits, and that either with or without further evidence *viva voce* or on depositions: provided nevertheless, that the practice heretofore adopted as to taking evidence in the court of the Vice-Warden and of the Steward's courts shall, nevertheless, in the meanwhile continue in each and every case until the same shall be altered by virtue hereof, or of the powers herein contained.

XVI. And be it further enacted, that it shall and may be lawful for the Vice-Warden to direct an issue of any fact arising before him in any suit instituted by bill, petition, or otherwise, on the equity side of the said court, to be tried by a jury, and to issue process to compel the attendance of jurors and witnesses for that purpose, and that the Vice-Warden shall have all necessary powers for trying the same, and carrying the verdict thereof into execution; and that after any such issue shall be tried a new trial may be moved before the Vice-Warden for the time being, who shall have power to grant or refuse such new trial, according to the rules of the common law and practice of the courts of Westminster in granting or refusing new trials.

XVII. And be it further enacted, that it shall and may be lawful for the Vice-Warden for the time being, whether he be at the time in the county of Cornwall or otherwise, in all cases which may be brought before him, whether in the county of Cornwall or otherwise, over which cases he has jurisdiction, to make such order by way of injunction or otherwise, as the nature of the case may require, notwithstanding he may adjourn his court to some future time or some other place; and that for the entry of pleadings, orders, proclamations and other matters touching the practice of the court in process and execution, the said court shall be considered and be at all times open; provided that nothing be therein done on any Sunday, Christmas Day, Good Friday, or any day appointed for a public fast or thanksgiving.

XVIII. And be it further enacted, that in case the Vice-Warden shall in any proceedings instituted for that purpose make any decree or decretal order against any person for the payment of any money due or payable in respect of the working or management of or the providing goods for any mine worked for any metal or metallic mineral, and the person against whom such order or decretal order shall be made, or any person in trust for him, shall have any share or interest in such mine, and shall not pay the sum so decreed to be paid, it shall and may be lawful for the Vice-Warden, under such regulations and in such ways as to him shall seem fit, to cause a sale of such share or interest, or of so much thereof as shall be necessary to raise such sum and the costs attending such sale.

XIX. And be it further enacted, that the seal of the Stannaries, heretofore used by and considered as the seal of the Vice-Warden for the time being, shall be and be deemed and taken to be the seal of the court of the Vice-Warden, and that every process issuing from either the equity or common law side of the said court shall issue under such seal; and that all orders, proceedings, documents, and copies by the laws of the Stannaries, as now existing, or by the Act, or by any rule or order of either side of the said court,